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$$r_1 = \sqrt{\frac{k^2 - (S + \theta)h}{\theta_2 - \theta}} \Delta am \left(\sqrt{\frac{\theta_2 - \theta_1}{\nabla}} \sqrt{k^2 - (S + \theta)h} t + f \right);$$

where θ , θ_1 , θ_2 are the roots of the cubic

$$(S + \theta)^3 - S(S + \theta)^2 + S(S + \theta) - \nabla = 0,$$

∇ being the determinant of the system A, B, C, —F, —G, —H, S the sum of A, B, C, and S that of the corresponding inverse quantities. Moreover p_1 , q_1 , r_1 are linear functions of p , q , r (the components of rotation about the axes for which A, B, C, &c. are calculated), the coefficients of which are determined in the paper itself.

III. "On the Fossil Human Jawbone recently discovered in the Gravel near Abbeville," in a Letter to the President, by W. B. CARPENTER, M.D., V.P.R.S. Received April 16, 1863.

University of London, Burlington House, W.
April 16, 1863.

DEAR MR. PRESIDENT,—I esteem it a privilege to have it in my power to communicate, through you, to the Royal Society some particulars of the important discovery just made by M. Boucher de Perthes, of a *human maxilla* in one of the gravel-beds near Abbeville also yielding the now well-known flint implements. Having been informed of this discovery a few days since, whilst staying in Paris, I became additionally desirous of carrying out my previous intention of stopping at Abbeville on my way homewards; and accordingly, after a short visit to Amiens,—which gave me the opportunity of disinterring for myself a small but well-characterized flint implement from the gravel-pit of St. Acheul,—I proceeded on the afternoon of Monday last to Abbeville, where I was received with the greatest kindness and attention by M. Boucher de Perthes.

The history of his discovery is given in the following extract from the local journal 'L'Abbevillois,' by which it will be seen that the specimen in question was removed by M. Boucher de Perthes himself from the bed in which the first indications of it had been found by the workman employed in that part of the excavation:—

"A la fin de mars dernier, le terrassier Halatre, travaillant à cette carrière, vint lui apporter avec un silex taillé un petit fragment d'os qu'il y avait également recueilli. Ayant débarrassé ce fragment du sable qui le couvrait, M. de Perthes aperçut une dent fort endommagée, mais qu'il n'en reconnut pas moins pour une molaire humaine.

“ Il suivit immédiatement Halatre à Moulin-Quignon, vérifia la place d'où venait la hachette et la dent, s'assura que cette place était nette de toute infiltration ou introduction secondaire et fit continuer la fouille.

“ Elle ne produisit ce jour-là aucun résultat nouveau.

“ Convaincu que quelqu'autre débris du corps d'où provenait cette molaire devait se trouver là, M. Boucher de Perthes recommanda aux terrassiers de ne rien déranger de ce qu'ils pourraient remarquer pendant son absence, mais de le prévenir sans retard. En effet, le 28 mars le terrassier Vasseur vint lui dire que quelque chose ressemblant à un os paraissait dans le banc.

“ Rendu sur les lieux, M. de Perthes trouve le terrain comme l'avait dit Vasseur. L'extrémité de l'os enfoncé dans sa gangue se montrait d'environ deux centimètres.

“ Voulant l'avoir entier, M. de Perthes fit, à l'aide d'une pioche, dégager les alentours et, à sa grande satisfaction, il put le retirer du banc sans le rompre.

“ Il ne s'était pas trompé dans ses prévisions. La dent avait annoncé la tête, et dans le morceau qu'il venait d'extraire, il reconnut une mâchoire humaine.—Un grand problème était résolu.

“ A quelques centimètres de ce fossile humain, le premier peut-être dont la position géologique eût été aussi nettement constatée, car, par une autre circonstance heureuse, les témoins ici ne manquaient pas, était une hache en silex également engagée dans le banc, d'où, sur l'invitation de M. Boucher de Perthes, M. Oswald Dimppe, jeune archéologue et dessinateur habile bien connu des savants qui ont visité Abbeville, l'enleva mais non sans s'aider aussi de la pioche.

“ Une chose qui frappa tous les spectateurs, ce fut la parfaite identité de patine ou de couleur de cette mâchoire, des silex taillés et des cailloux roulés, avec le banc qui les contenait, couleur brune, presque noire, contrastant singulièrement avec la teinte jaune ou grise des bancs supérieurs et la craie blanche sur laquelle elle repose.

“ Mesure prise de chacune des couches supérieures, la mâchoire fossile était ainsi que les hachettes à 4 mètres 52 centimètres* de la superficie et tout près de la craie.

“ Ce banc de Moulin-Quignon, placé sur le plateau qui domine la vallée, se trouve à 30 mètres au-dessus du niveau de la Somme et de la mer.”

* About 14 feet 10 inches.

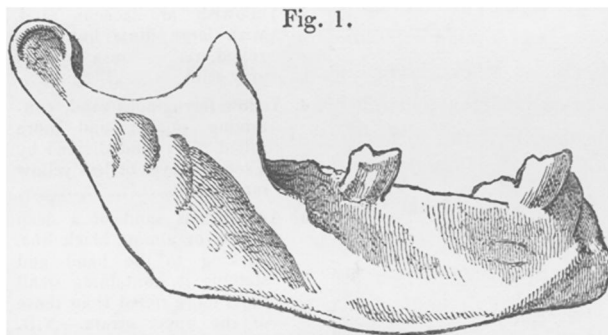
The particulars I have now to communicate as the result of my own personal examination should, I think, most completely satisfy any unprejudiced person that, on the one hand, the specimen cannot have been a "plant" contrived by the workman, and, on the other, that it could not have found its way into the bed in which it was discovered by any disturbing agency subsequent to the original deposition of that bed*.

When M. Boucher de Perthes had the kindness to place in my hands this precious fragment—which consists of the right half of the lower jaw, containing three teeth—I was immediately struck with its almost black colour, its solidity, and its weight: all these peculiarities (which are in marked contrast to the characters of the bones ordinarily found in these gravel-pits) being obviously due to one and the same cause, viz. metallic (ferruginous?) infiltration. The ordinary flints, and the flint implements obtained from the same deposit, several of which are in the museum of M. de Perthes, are all of them characterized by a like depth of ferruginous tint, which is not seen in any of those taken from any other part of the same pit, or from any other gravel-pit yet opened in the neighbourhood of Abbeville.

As to the anatomical characters of this jaw, I should not wish, without a more careful comparative examination of the specimen than I had the opportunity of making, to give any decided opinion; but my impression is that they differ very decidedly from those of the same bone in any race at present inhabiting Western Europe.

* I think it right to leave my original statement as the record of the impression which was made not only upon myself, but upon other more competent observers, by the first examination of the specimen in question, which was limited to its external characters. Its *colour* has been subsequently proved to be due to the adhesion of a thin layer of the ferruginous matrix, which adhered closely to its surface, and yet could be readily washed off, leaving the bone but slightly stained. The impression of *solidity* was produced by the density of the bone itself; the lower jaw being the densest bone in the body next to the petrous portion of the temporal bone, and having in aged subjects an almost ivory-like hardness. The impression of *weight* was not really produced by metallic infiltration, as was at first supposed, but was partly due to a want of adequate allowance for the density of the bone itself, and partly to the adhesion, on one side, of a good deal of the matrix, which has been found to contain as much as 12 per cent. of oxide of iron; and it may also have been in part *subjective*, arising from a preconception, suggested by the general appearance of the bone, that it had undergone infiltration. The colour of the flint implements said to have been found in the same deposit, has proved to be removable by washing; whilst some of the ordinary flints are stained by real ferruginous infiltration.—June 15, W. B. C.

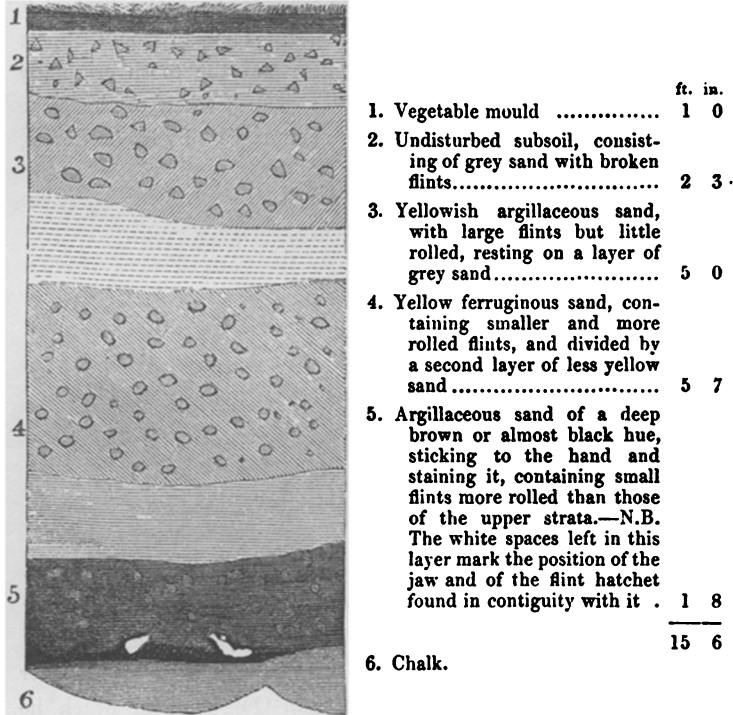
I was struck with the *thickness* of the bone, the great *breadth* of the ascending ramus, but especially with the extraordinary breadth and depth of the groove between the ramus and alveolar border, in which I could almost lay my little finger. The jaw would appear to be that of a person advanced in life; and the tooth originally found, which very probably belonged to the other half of the same jaw, seemed to me to have been "endommagée" by *caries* during life rather than by subsequent violence.



M. Boucher de Perthes had the kindness to give me the accompanying sketch of the specimen; and I can testify to the accuracy of its representation of the general form of the bone.

On Tuesday morning I repaired, in company with M. Boucher de Perthes, to the gravel-pit of Moulin-Quignon; in which he showed me, as nearly as he could, the situation in which this most interesting relic had been found. Unfortunately there had occurred, a few days previously to my visit, a *slip* of the overlying strata, by the débris of which the exact spot was covered; but a part of the same deposit was visible at a horizontal distance of a yard or two, so that I could indubitably verify its position and its general characters. This deposit, distinguished from every other by the extreme depth of its ferruginous tint (which corresponds exactly to that of the bone), lies *at the very bottom of the pit, in immediate contact with the subjacent chalk*, as shown in the accompanying representation of the section (also kindly given to me by M. Boucher de Perthes), to the general accuracy of which I can bear the most explicit testimony. I myself took away from this deposit some specimens of the small rounded flints which it contains, and which will serve to show you this peculiar tint.

Fig. 2.—Section of the Strata in the Gravel-pit of Moulin-Quignon, near Abbeville.



These facts must be admitted, I think, to exclude any possibility of doubt as to the truly fossil character of this bone. Its peculiar condition could not have been produced by any artificial means at present known, and most assuredly indicates that it must have been long buried in the deposit from which its metallic impregnation has been derived*.

That it could not have found its way into that deposit in any other mode than by *original imbedding*, may be fairly concluded from the entire absence of the least *indication* of disturbance in the

* The cogency of these inferences is of course invalidated by the proved incorrectness of the impressions on which they were founded, as stated in the preceding note. How far the genuineness of the specimen is supported or contravened by other evidence, is a question on which there is at present so great a diversity of opinion among experienced Palæontologists, that I think it better to abstain from any judgment in regard to it.—June 15, W. B. C.

superjacent strata, which are most regularly superposed (as seen in the accompanying section) to a depth of more than 15 feet. This complete regularity of superposition in the strata of the gravel-pits of Moulin-Quignon has, I understand, been already verified by numerous experienced geologists, whose testimony upon such a point is of far higher value than mine; but it is so obvious that I cannot imagine the least doubt to remain in the mind of any intelligent observer who may visit the locality and examine its condition for himself, of the jaw having been imbedded in the lowest stratum before the deposition of the superincumbent layers.

I have further to point out, that as the gravel-bed of Moulin-Quignon is about 100 feet above the present level of the river, it corresponds in position with the *upper* gravel of St. Acheul, not with the *lower* gravel of Menchecourt. If, therefore, we accept the conclusions of Mr. Prestwich as to the relative ages of these gravels, this human jaw was buried in the *very oldest* portion of the *earliest* of these fluviatile deposits, and therefore dates back to the very remotest period at which we have at present any evidence of the existence of Man.

Believe me, dear Mr. President,

Yours faithfully,

WILLIAM B. CARPENTER.

April 23, 1863.

Major-General SABINE, President, in the Chair.

The Right Hon. Sir Edmund Walker Head was admitted into the Society.

The following communications were read :—

- I. "On the Diurnal Inequalities of Terrestrial Magnetism, as deduced from observations made at the Royal Observatory, Greenwich, from 1841 to 1857." By GEORGE BIDDELL AIRY, F.R.S., Astronomer Royal. Received April 8, 1863.

(Abstract.)

The author describes this paper as one of the class which gives the epitomized results of long series of voluminous observations and laborious calculations, of which the fundamental details have been